

MAT 2440 - Prof. Ghezzi
Review Problems for Exam 1

NAME: _____

1. Find the bitwise OR and bitwise AND of the bit strings 10 1001 1101 and 01 1000 1011.
2. Use a truth table to determine if $(p \rightarrow r) \wedge (q \rightarrow r)$ and $(p \vee q) \rightarrow r$ are logically equivalent. Justify your answer.
3. Determine the truth value of each of the following statements. Give reasons for your answer. Assume that x and y are integers.
 - a) $\exists x \exists y (x - 2y = 4 \wedge 2x + 4y = 12)$.
 - b) $\exists x (x = -x)$.
 - c) $\exists x \forall y (x < y^2)$.
 - d) $\exists x (|x| = -5)$.
4. Use a membership table to prove or disprove: if A and B are sets then $A \cup B = (A - B) \cup (B - A)$. Justify your answer.
5. Prove that the difference of two rational numbers is a rational number.
6. Prove that if n is an integer and $3n + 2$ is even, then n is even.
7. Determine whether each of these arguments is valid.
 - a) If n is a real number with $n > 2$, then $n^2 > 4$. Suppose that $n^2 \leq 4$. Then $n \leq 2$.
 - b) If n is a real number with $n > 2$, then $n^2 > 4$. Suppose that $n \leq 2$. Then $n^2 \leq 4$.
8. Let $U = \{1, 2, 3, \dots, 15\}$, $A = \{2, 4, 6, 8, 10\}$, and $B = \{4, 5, 7, 8, 13, 15\}$. Determine the following sets.
 - a) $A \cup B$
 - b) $A \cap B$
 - c) $A - B$
 - d) $B - A$
 - e) \bar{A}
 - f) Express A with a bit string.
9. Draw a Venn diagram for $\bar{A} \cap \bar{B}$.